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MORRISON & FOERSTER LLP
755 PAGE MILL RD
PALO ALTO, CA 94304-1018

EXAMINER

MOORE, WILLIAM W

ART UNIT	PAPER NUMBER
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1656

DATE MAILED: 01/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/884,455	Applicant(s) HOUGHTON ET AL.	
	Examiner William W. Moore	Art Unit 1656	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response

Applicant's Response filed 12 October 2005 is responsive in its arguments to the rejections of record stated in the communication mailed 12 April 2005 but no claim among the pending claims 27-36 is amended. Applicant's preliminary amendments to the specification filed 19 February 2002 indeed provide sequence identifiers throughout the specification.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b). Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 27-30 remain rejected for reasons of record under the judicially created doctrine of obviousness- type double patenting as being unpatentable over claims 1-4 of U.S. Patent No. 5,585,258 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claims 31-35 remain rejected for reasons of record under the judicially created doctrine of obviousness- type double patenting as being unpatentable over claims 5-9 of U.S. Patent No. 5,585,258 in view of Benson et al., U.S Patent No. 5,258,496 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

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Claim 36 remains rejected for reasons of record under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 3-5 of U.S. Patent No. 5,597,691 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claims 27 and 30 remain rejected for reasons of record under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 2 of U.S. Patent No. 5,712,145 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claims 31, 32 and 35 remain rejected for reasons of record under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 3-5 of U.S. Patent No. 5,712,145 in view of Benson et al., U.S. Patent No. 5,258,496 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claim 36 remains rejected for reasons of record under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 7 and 8 of U.S. Patent No. 5,712,145 for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

The following are provisional obviousness-type double patenting rejections because the conflicting claims have not in fact been patented.

Claims 27 and 30 remain provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 11 of copending Application No. 10/409,094, an application for reissue of U.S. Patent No. 5,585,258, for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon

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an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claim 36 remains provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 6 of copending Application No. 10/409,673, an application for reissue of U.S. Patent No. 5,597,691, for the reasons set forth at pages 3-5 of the communication mailed 01 July 2004. While Applicant states at page 5 of the Response that a terminal disclaimer will be filed upon an indication of allowable subject matter herein, the rejection must be maintained until and unless an effective terminal disclaimer is filed.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 27-36 remain rejected for reasons of record under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The rejection of record stated at pages 4-11 in the communication mailed 12 April 2005 indicates why proteins of the claimed compositions and assay that comprise the regions of the hepatitis C virus polyprotein present in the fusion polypeptides P600, P500, P300 and P190 of the specification's Example 5 have no structure sufficient for HCV-specific proteolysis even though these proteins comprise amino acids recognized in the art to be necessary for two separate kinds of HCV-specific proteolyses. These proteins comprise the amino-proximal 155 amino acids of human superoxide dismutase [hSOD] fused to HCV amino acids 946 through 1630 [P600], 946 through 1457 [P500], 946 through 1244 [P300], and 964 through 1144 [P190]. It is agreed that each of these protein includes the His952 and Cys993 later found to be necessary for NS2/NS3 protease cleavage. It is also agreed that the P600, P500, P300 and P190 proteins include the His1083 and Asp1107 needed for NS3/NS4A serine protease cleavage, and

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that the P600, P500, P300 proteins, but not the P190 protein, include the Ser1165 needed for NS3/NS4A serine protease cleavage. The Declaration under 37 CFR 1.132 of Dr. Amy J. Weiner submitted with the Response was considered together with the Applicant's arguments at pages 7-15 of the Response filed 12 October 2005 have been fully considered but the arguments presented are not persuasive. Applicant's concerns in the first full paragraph at page 6 of the Response are moot where Pallaoro et al., of record, teach that even a minimal NS2/NS3 protease, if fused to a heterologous solubilizing peptide, is capable of authentic auto-processing activity when expressed in an *E. coli* host cell.

Applicant's primary argument is that the specification inherently discloses a specific proteolytic activity native to, i.e., authentic to, an HCV polypeptide, the HCV NS2/NS3 protease's auto-processing cleavage, see pages 6 and 7 of the Response, proposing that the P600 fusion protein having the 686-amino acid sequence of Figure 1 and SEQ ID NO:86 is an adequate written description of a "NS3 domain hepatitis C virus protease or active . . . truncation analog" having a proteolytic activity required of proteins of the claimed compositions and assay comprising: an NS2/NS3 protease activity. SEQ ID NO:86 and the sequence of Figure 1 correspond to the amino acid sequence of the entire P600 fusion protein and SEQ ID NO:70 represents the HCV amino acid sequence therein. Applicant also points to the 299- and 202-amino acid sequences present within SEQ ID NO:70 that are set forth, respectively, in SEQ IDs NOs:66 and 65, as adequate written descriptions of proteolytically active "truncation analogs" of at least SEQ ID NO:70. Applicant then argues at page 7 of the Response that a peptide substrate for an HCV protease is disclosed in the specification where Example 5 reports a "specific cleavage with the NS3 domain" region of the P600, P500 and P300 proteins expressed in *E. coli* host cells. Applicant next argues at pages 7-11 of the Response that Example 5 discloses an HCV-specific protease activity because the cleavage products reported

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in the Example must result from autocatalysis mediated by a subsequently described HCV NS2/NS3 protease.

Applicant separately argues at pages 11-13 of the Response that Examples 10 and 11 of the specification provide a constructive reduction to practice of an NS3 domain protease in view of both disclosures in the specification of the catalytic triad of amino acids in Applicant's HCV isolate - His1083, Asp1107 and Ser1165 - and the publication by Eckart et al., of record, which compares (i) the HCV NS2/3 autocatalytic activity of the protein encoded by the pG3ZYPN plasmid, see Figure 2 at page 403, which the Response indicates, see the footnote at page 13, has 106 further HCV NS2 domain amino acids beyond the amino-terminus of SEQ ID NO:70 and eleven fewer HCV NS3 domain amino acids at the carboxyl-terminus of SEQ ID NO:70, with (ii) the HCV NS3/NS4A serine protease activity of proteins encoded by the pG3ZYPS and gG3ZYBB plasmids, see page 404 where Figure 3A illustrates cleavage products of the former and Figure 3B illustrates cleavage products of the latter. Both of the proteins encoded by the pG3ZYPS and gG3ZYBB plasmids comprise the entire NS3 domain and at least the first 139 amino acids of the NS4 domain, including the entire NS4A region, see the description of coordinates for the latter in the legend for Figure 3B.

As noted in the communication mailed 12 April 2005, the specification defines an HCV NS3 domain protease as having termini established "by **expression and processing in an appropriate host** of a DNA construct **encoding the entire NS3 domain**" [emphasis supplied]. The specification teaches, pages 6-9, that the protease activity of the NS3 domain is that of a serine protease, identifying the catalytic triad of histidine, aspartate, and serine present in such proteases in Tables 1 and 2, each of which is present in the P600, P500, P300 fusion polypeptides of Example 5 and two of which are present in the P199 fusion polypeptide. Pages 22-23 of the specification further define the disclosure as directed to a serine protease at lines 17-24 and the

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specification does not discuss or suggest the activity of an HCV protease other than a serine protease. Applicant acknowledges that the P600, P500, P300, and P199 fusion polypeptides each include the carboxyl-terminal 81 amino acids of an HCV polyprotein NS2 domain, commencing at position 946 of the polyprotein by Applicant's HCV isolate. Applicant also acknowledges that SEQ ID NO:70, corresponding to the HCV polyprotein region in the P600 protein having a carboxyl-terminus at position 1630 of the polyprotein by Applicant's HCV isolate, includes all but the 23 carboxyl terminal amino acids of an HCV NS3 domain. Compare SEQ ID NO:70 with the amino acid sequences of Figure 1 of Choo et al., 1991, made of record herewith, and of Figures 1D through 1E of Houghton et al., US 5,863,719, made of record with the Information Disclosure Statement filed 9 April 2003. Further compare the polypeptide expressed by the pG3ZYPN plasmid described at page 400, second paragraph of Material and Methods, of Eckart et al., made of record with Applicant's Information Disclosure Statement, using the nucleotide sequence positions in Figures 1A through 1G of the '719 patent when numbered from the "-319" position of Figure 1A which corresponds to the "-319" position at the 5' terminus of the nucleotide sequence in Figure 1 of Choo et al., 1991. In addition to the 106-amino acid extension into the HCV NS2 domain and the exclusion of eleven amino acids of the NS3 domain of the P600 protein noted above, the protein encoded by the pG3ZYPN plasmid of Eckart et al. differs from the specification's p600 fusion polypeptide by the replacement of the human superoxide dismutase region at the amino terminus of the p600 fusion polypeptide with a single, initiating, methionine.

It is agreed that the specification's SEQ IDs NOs:65, 66, 68 and 70, as well as the HCV NS2-NS3 protein encoded by the pG3ZYPN plasmid of Eckart et al., all comprise the art-recognized NS2/3 cleavage site at positions 1005 through 1014 of the polyprotein encoded by Applicant's HCV isolate, corresponding to positions 60-69 of SEQ ID NO:70. Compare these amino positions in Figure 1E of the '719 patent with

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Figure 1 of Reed et al., 1995, of record. It is also agreed that the specification's SEQ IDs NOs:65, 66, 68 and 70, and the HCV NS2-NS3 protein encoded by the pG3ZYPN plasmid of Eckart et al. lack the art-recognized NS3/NS3A protease cleavage sites between the NS3 and NS4 regions and the NS4 and NS5 regions of the HCV polyprotein, and that further divide the NS4 and NS5 regions internally. See Figure 2(c) of Yao et al., 1999, of record. Apart from position taken at pages 12-15 of the Response, Applicant proposes that the specification be construed to disclose a "NS3 domain protease" as having the activity of a NS2/NS3 protease in cleaving the NS2-NS3 cleavage site between positions 1026 and 1027 of the HCV polyprotein encoded by Applicant's isolate, corresponding to positions 65 and 66 of SEQ ID NO:70. See the C-terminal amino acids of Figure 1 of Pallaoro et al., and see also Figure 2 of Grakoui et al., Figure 1 of Santolini et al., and Table II of Thibeault et al., all of record.

Because Applicant no longer maintains that Example 5 of specification discloses the activity of a serine protease residing within an HCV NS3 domain and instead argues that the specification inherently discloses an HCV polypeptide possessing an authentic, native, HCV proteolytic activity of the NS2/NS3 protease, the issue of whether the specification provides an adequate written disclosure of proteins of the claimed compositions and assay rests on whether the P600, P500, P300 and P190 polypeptides of Example 5 provide enough of the art-recognized structure of an HCV NS2/NS3 protease to permit cleavage at the art-recognized NS2/NS3 cleavage site **that is present in each of these proteins**. The discoveries of others made after the effective filing date of the instant application, discussed in the following paragraphs A through E, show that the HCV polyprotein amino acid sequence beginning at position 946 and extending through at least position 1144 in the P190 polypeptide, corresponding to the positions 1 through 198 of SEQ IDs NOs:66-68 and 70 and shared by all proteins in Example 5 of the specification, cannot provide a structure sufficient to support the

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proteolytic activity of an HCV NS2/NS3 protease. Each paragraph compares findings of publications of record with the amino acid sequences of the P600, P500, P300 and P190 proteins and with the amino acid sequence of the pG3ZYPN- protein [pG3ZYPN protein] of Eckart et al. cited in Applicant's arguments.

A. Hijikata et al., of record, found that "[a]t least the region from residue 898 to 1233 was . . . essential for the detection of [the Zn^{++} -dependent metalloprotease] Cpro-1 activity" in *in vitro* transcription/translation experiments. See page 4673. The P600, P500, P300 and P190 polypeptides each lack the 49-amino acid region between positions 898 and 946 that Hijikata considered sufficient and the P190 polypeptide also lacks the region between HCV polyprotein positions 1144-1233. By way of comparison, the pG3ZYPN- protein has an amino acid sequence that extends from position 840 to position 1619 of an HCV polypeptide, a 106-amino acid amino-proximal extension into the NS2 domain beyond any protein of the specification's Example 5, thus clearly provides a structural basis sufficient for the activity of an HCV NS2/NS3 protease according to Hijikata et al.

B. The amino acid sequence of the pG3ZYPN protein is also similar to the HCV amino acid sequence region that Grakoui et al., of record, found important for the activity of an HCV NS2/NS3 protease: "HCV sequences between residues 827-1207 appear required for efficient processing at the 2/3 site in mammalian cells". See page 10584. Grakoui et al. used expression plasmids prepared for another publication, however, thus did not investigate additional amino-terminal truncations on the NS2 domain region corresponding to those made by Hijikata et al. Each of the P600, P500, P300 and P190 polypeptides lacks the N-proximal NS2 domain amino acid region from position 827 through position 946 that Grakoui et al. utilized and the P190 polypeptide lacks the region from positions 1144-1207 employed by Grakoui et al. The report of Reed et al., of record, agrees with those of Grakoui et al., see page 4134, but Reed et

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al. likewise made no amino-terminal truncations that corresponds to those of Hijikata et al., using instead for comparison an HCV NS2/NS3 protein extending from position 936 through position 1039 defective in protease activity.

C. Santolini et al., of record, determined, that the “N-terminal boundary of the NS2 portion (of the NS2/NS3 protease) . . . appears to be located between (positions) 849 and 923”, while the “C-terminal boundary of the NS3 portion . . . appears to be located between positions 1137 and 1237”. See page 7463. A related group of investigators, Pieroni et al., of record, considered, page 6376, “that the minimal region of the HCV BK (isolate) precursor required for processing at the NS2-3 site extends from aa 849 to 1237.” While the P600, P500, P300 and P190 polypeptides all lack the 23-amino acid region of the minimal NS2 domain between positions 923 and 946 that Santolini et al. and Pieroni et al. found was sufficient for NS2/NS3 protease activity, all have carboxyl termini extending beyond the minimum region commencing at position 1137 that Santolini et al. and Pieroni et al. found to be sufficient in the HCV NS3 domain. As before, the pG3ZYPN protein’s amino acid sequence extends from the HCV polyprotein position 840 through its position 1619, providing a structural basis sufficient for the activity of an HCV NS2/NS3 protease according to Santolini et al. and Pieroni et al.

D. Pallaoro et al., of record, made a series of critical truncations within the NS2 domain region of an HCV NS2/NS3 protease, which they considered to more likely be a bi-molecular cysteine protease rather than a metalloprotease, and found that segments having amino termini at either position 903 or position 907 within an HCV polyprotein NS2 domain, and sharing a carboxyl terminus at position 1026 in an HCV polyprotein NS3 domain, were active auto-processing NS2/NS3 proteases, see Figure 1 at page 9941, whether they were expressed in a cell-free *in vitro* transcription/translation system or as a solubilized fusion polypeptide in an *E. coli* host cell. But Pallaoro et al. found that segments having amino termini at either of positions 913 or 918 in the NS2 domain,

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but also having a carboxyl terminus at position 1026 in the NS3 domain, had no activity. Most significantly, and a discovery not considered by Applicant's arguments at pages 10-11 of the Response, Pallaoro et al. found that the truncations show that "the (alpha-) helix (region) predicted to exist between residues 915 and 928" was structurally insufficient for protease activity even though they had initially considered it "the first structurally and/or functionally important segment." Instead, the portion of the NS2 domain that provided protease activity, whether expressed as a fusion polypeptide or as an unique HCV protein, was the region that is "immediately after the last predicted transmembrane segment", i.e., including at least position 907 of an HCV polyprotein. See page 9941 at top of left column and Figure 1's legend. The pG3ZYPN protein has an amino acid sequence that extends from position 840 through position 1619 of an HCV polypeptide, clearly providing a structural basis for HCV NS2/NS3 protease activity according to the discoveries of Pallaoro et al. where it includes the region that Pallaoro found to be sufficient for protease activity, but the P600, P500, P300 and P190 polypeptides all lack the 39-amino acid NS2 domain region between positions 907 and 946 that Pallaoro et al. found sufficient for protease activity even though all but the P190 polypeptide have carboxyl termini extending beyond the minimum region ending at position 1206 that Pallaoro et al. considered to be sufficient in the NS3 domain of an HCV polypeptide.

E. Thibeault et al., of record, determined that a segment of an HCV polyprotein having an amino terminus at position 904, within the same NS2 region immediately after the last predicted transmembrane segment that Pallaoro found to be sufficient for protease activity, and a carboxyl terminus at position 1026 within the NS3 domain, was fully active as an auto-processing protease. Again, the amino acid sequence of the pG3ZYPN protein provides a structural basis that is sufficient for HCV NS2/NS3 protease activity according to Thibeault et al. but the P600, P500, P300 and P190

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polypeptides all lack the 42-amino acid NS2 domain region between the polyprotein positions 904 and 946 that Thibeault et al. found sufficient for NS2/NS3 protease activity, even though all but the P190 protein have carboxyl termini beyond the minimum region ending at position 1206, within the NS3 domain, Thibeault et al. found sufficient for NS2/NS3 protease activity.

There can be no agreement with Applicant's arguments at pages 6 through 11 of the Response that the specification inherently discloses the activity of an HCV NS2/NS3 protease and inherently discloses a peptide substrate for an HCV protease, an auto-processing NS2/NS3 protease, in view of the fact that each of the P600, P500, P300 and P190 fusion polypeptides lack the regions of the HCV NS2 domain found by Hijikata et al., Grakoui et al., Reed et al., Santolini et al., Pieroni et al., Pallaoro et al. and Thibeault et al. to be required for the authentic auto-processing activity of the HCV NS2/NS3 domain protease. These findings by the diverse groups of artisans cited above who investigated the NS2 and NS3 regions of the HCV polyprotein to determine which portions therein are sufficient for auto-processing cleavage activity of NS2/NS3 proteases all show that the specification provides no adequate written disclosure of an HCV NS3 protease, an NS2/NS3 protease, or any other HCV protease, by a protein of the claimed compositions and assay. Where the specification fails to disclose or teach the structure of the portion of HCV polyprotein sufficient for cleavage at the NS2-NS3 boundary, no "truncation analogs" thereof can adequately be disclosed.

Similarly, there can be no agreement with Applicant's arguments at pages 11 to 13 of the Response that the publication of Eckart et al. supports a constructive reduction to practice of an NS3 domain serine protease that either "comprises" or "consists of" SEQ ID NO:65 in Examples 10 and 11 of the specification. This is because the various proteins expressed with the pG3ZYPS and gG3ZYBB plasmids of Eckart et al., whether or not the Ser1165Gly mutation is present, share the entire NS3 domain and all of the

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NS4A region of the NS4 domain, structural regions subsequently determined by others to be sufficient for cleaving at the NS3-NS4 boundary. None of the proteins disclosed in the specification possess either the NS3 domain region adjacent to the NS3-NS4 boundary or the NS4 region adjacent to NS3-NS4 boundary.

In view of the fact that each of the P600, P500, P300 and P190 fusion polypeptides lack the regions of the HCV NS2 domain found by Hijikata et al., Grakoui et al., Reed et al., Santolini et al., Pieroni et al., Pallaoro et al. and Thibeault et al. to be required for the authentic auto-processing activity of the HCV NS2/NS3 protease, there can be no agreement with Applicant's arguments at pages 5 through 11 of the Response that the specification adequately discloses the inherent activity of an HCV NS2/NS3 protease required by proteins of the claimed compositions and assay, and that it inherently discloses a peptide substrate for an HCV protease, an auto-processing NS2/NS3 protease. These findings by the diverse groups of artisans cited above who had all investigated the NS2 and NS3 regions of the HCV polyprotein to determine which portions therein are sufficient for the auto-processing cleavage activity of NS2/NS3 proteases all show that the specification provides no adequate written disclosure of an HCV NS3 serine protease, an NS2/NS3 protease, or any other HCV protease, by a protein of the claimed compositions and assay. Where the specification fails to disclose or teach the structure of the portion of HCV polyprotein, sufficient for cleavage at the NS2-NS3 boundary, no "truncation analogs" thereof can adequately be disclosed.

Similarly, there can be no agreement with Applicant's argument at pages 11 through 13 of the Response that the publication of Eckart et al. supports a constructive reduction to practice of an NS3 domain serine protease that either "comprises" or "consists of" SEQ ID NO:65 in Examples 10 and 11 of the specification. This is because the various proteins expressed with the pG3ZYPS and gG3ZYBB plasmids of Eckart et al., whether or not the Ser1165Gly mutation is present, share the entire NS3 domain and all of the

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NS4A region of the NS4 domain, structural regions subsequently determined by others to be sufficient for cleaving at the NS3-NS4 boundary. None of the proteins disclosed in the specification possess either the NS3 domain region adjacent to the NS3-NS4 boundary or the NS4 region adjacent to NS3-NS4 boundary.

The specification provides no independent basis for concluding that a cleavage occurred at the art-recognized HCV NS2/NS3 protease cleavage site between positions 1026 and 1027 present in each of the P600, P500, P300 and P190 proteins where the calculated molecular mass, 24.9 kD, of a cleavage product consisting of the 155 amino acids of hSOD fused to the 81 HCV NS2 domain amino acids at positions 1-236 of SEQ ID NO:86 up to the NS2/NS3 protease cleavage site is clearly much less than the 34 kD relative molecular mass reported in the specification. See pages 19 and 20 below with an EXPASY pI/MW tool calculation [http://ca.expasy.org/tools/pi_tool.html]. The Federal Circuit has said that a sufficient written description of a genus of biologically active molecules may be achieved by disclosure of a representative number of such molecules defined by their sequence structure by or recitations of structural features common to members of the genus, which features constitute a substantial portion of the genus. Where no disclosed embodiment constitutes an adequate written description of proteins of the claimed compositions and assay, the diverse, undisclosed, species that "comprise" an NS3 domain or truncation analogs thereof also are not supported by an adequate written description. The rejection of record, based on the disclosures of those in the art whose work is most closely associated with the mechanism proposed by Applicant, is therefore maintained.

Claims 29, 30, 33, and 43 remain rejected for reasons of record under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The rejection of record stated in the communication mailed 12 April 2005 indicates why the regions of the hepatitis C virus polyprotein present in the fusion polypeptides P600, P500, P300 and P190 of the specification's Example 5 are insufficient for HCV-specific proteolysis and why claims 29, 30, 33, and 43 that describe genera of proteins of the claimed compositions and assay comprising either SEQ ID NO:63 or SEQ ID NO:64 are unsupported by an adequate written description. Applicant's arguments at page 14 of the Response filed 12 October 2005, i.e., that SEQ ID NO:63 comprises the histidine necessary for HCV NS3 serine protease proteolytic activity and that SEQ ID NO:64 comprises the serine necessary for HCV NS3 serine protease proteolytic activity, have been fully considered but they are not persuasive. The facts Applicant argues are not in dispute, yet the specification fails to disclose, discuss, suggest, or teach those further features of a fragment of an HCV polyprotein sufficient for the NS2/NS3 protease activity that Applicant proposes as a basis for the claims' description of proteins of the claimed compositions and assay. This is because the structural features of SEQ IDs NOs:63 and 64 are insufficient to provide a protein with NS2/NS3 protease activity, just as are the features of the more extensive P600, P500, P300 and P190 proteins, all of which comprise both SEQ IDs NOs:63 and 64, are insufficient to provide a protein with NS2/NS3 protease activity for the reasons set forth above. The Federal Circuit has said that a sufficient written description of a genus of biologically active molecules may be achieved by disclosure of a representative number of such molecules defined by their sequence structure by or recitations of structural features common to members of the genus, which features constitute a substantial portion of the genus. Similarly, an adequate written description of a genus of proteins may be achieved by disclosure of a representative number of proteins defined by amino acid sequence or a recitation of structural features common to members of the genus, which features constitute genus. Because no genera of proteolytically active proteins having the separate regions of a

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serine protease present in either of SEQ IDs NOs:63 or 64 are disclosed, the rejection of record is therefore maintained.

Claims 27-36 remain rejected for reasons of record under 35 U.S.C. § 112, first paragraph, because the specification does not reasonably provide enablement for preparing a protein of the claimed compositions and assay, including the P600, P500, P300 or P190 proteins, that has an HCV-specific protease activity, or generic versions thereof, or active truncation analogs thereof. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims.

Applicant's arguments at page 15 of the Response filed 12 October 2005 that Examples 4 and 5 of the specification disclose "the structure and activity of a[n HCV] NS2/3 protease", and that the specification provides a "constructive reduction to practice" and "the structure" of an HCV NS3 serine protease, have been fully considered but they are not persuasive. As indicated in the rejection of record stated in the communication mailed 12 April 2005, the NS2 and NS3 domain regions present in the disclosed P600, P500, P300 and P190 proteins Applicant proposes to be sufficient for HCV NS2/NS3 protease activity have been shown by the subsequent discoveries of others, cited hereinabove and in the rejection of record, to actually be insufficient for HCV NS2/NS3 protease activity. Thus the specification provides no guidance for the preparation of proteins of the claimed compositions and assay capable of cleaving the art-recognized NS2-NS3 cleavage site present in all of the P600, P500, P300 and P190 proteins by virtue of an authentic HCV NS2/NS3 protease activity. While the specification identifies a region within the NS3 domain of an HCV polyprotein having the sequence characteristics of a serine protease, i.e., the amino acid sequence set forth in SEQ ID NO:65, and points to analogies between this region and serine proteases located in similar regions of polyproteins encoded by flavivirus genomes, it provides no guidance for preparing proteins of the claimed compositions and assay that cleave the art-recognized NS3-NS4 cleavage site because this site is absent from the P600, P500, P300 and P190 proteins. The rejection of record is therefore maintained.

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The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 27-36 remain rejected for reasons of record under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant's arguments filed 12 October 2005 have been fully considered but they are not persuasive. At page 16 of the Response, Applicant argues limitations that are not present in the claims in pointing to pages 3, 6, and 7 of the specification. Claim 1 currently recites, "an NS3 domain hepatitis C virus **protease or an active . . . truncation analog**" (emphasis supplied), but no sequence identifier is present in claim 1 with which it can be determined where truncation might begin to define the analogs that "comprise" the peptides of SEQ IDs NOs:63 and 64 of claims 29, 30, 33, and 34, or that "comprise" the larger 202-amino acid sequence of SEQ ID NO: 65 of claims 30 and 35. There is no indication in the specification permitting the public and one of ordinary skill in the art to distinguish a "domain" from "an active truncation analog" of proteins of the claimed compositions and assay of the independent claims 27, 31, and 36 from proteins of the claimed compositions of the dependent claims 28-30 and 32-35 because the specification has no structural description of the metes and bounds of a NS3 domain protease distinguishable from a "truncation analog". The public and the artisan seeking to establish the scope of the claimed subject matter cannot determine what is more than a "domain", thus excluded by the claim, from what is less than a "domain" and at the same time a truncation analog of the claim. The issue presented by these claims is the lack of a definite description of the intended subject matter and the rejection of record is maintained.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

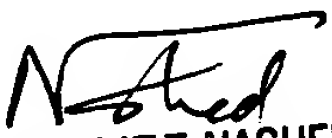
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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William W. Moore whose telephone number is 571.272.0933 and whose FAX number is 571.273.0933. The examiner can normally be reached Monday through Friday between 9:00AM and 5:30PM EST. If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisory Primary Examiner, Dr. Kathleen Kerr, can be reached at 571.272.0931. The official FAX number for all communications for the organization where this application or proceeding is assigned is 571.273.8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571.272.1600.

William W. Moore
6 January 2006


NASHAAT T. NASHED PHD.
PRIMARY EXAMINER